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EMO

NATIONAL DIGEST

State of Emergency Welfare Services
Communications in Civil Defense
Architect's Role in Civil Defence
Ontario Auxiliary Police
North American Air Defence (NORAD)
Trends in Fallout Protection
Index 1965

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In addition to publishing articles which reflect Canadian Government policy the Digest may also publish articles by private individuals on subjects of current interest to the emergency measures programme. The views of these contributors are not necessarily subcribed to by the Federal Government.

Director General: C. R. PATTERSON *Editor:* A. M. STIRTON

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1966

THE STATE OF EMERGENCY WELFARE SERVICES

Prepared by Emergency Welfare Services Division,
Department of National Health and Welfare.

LAST SEPTEMBER, when the chlorine carrying tanks of a sunken ship threatened a city during the devastation of Hurricane Betsy, one's memory could go back to 1961 when the city of Natchez, Mississippi was similarly threatened. In this case previous experience helped avert what might have been a major disaster. There is usually no opportunity to rehearse for emergency. Explosions, fires, floods and tornadoes hit with terrifying speed. The state of preparedness of any emergency service can only be anticipated by assessing its possible effectiveness should a sudden peacetime or nuclear disaster occur.

This article is intended to give some indication of the state of preparedness existing across the country as far as Emergency Welfare Services (EWS) is concerned. The true test would be the speed and effectiveness with which communities could provide for the survival of their own citizens as well as for other homeless victims of disaster. Since this state of preparedness can be assessed only by the provinces and communities concerned, this discussion will be concerned primarily with the ways and means by which the federal EWS organization assists the regions in attaining an operational capability to cope with any disaster.

The Need for EWS

The peacetime welfare needs of people are basically the same as in wartime. However, in a national disaster, needs would be more sudden and urgent and on a much larger scale. People would have to be clothed, lodged and fed. They would want information about their missing family members. Many would need assistance in solving the diversified personal problems which beset people in time of trouble. To relieve the widespread physical and emotional suffering, a strong organization of trained people possessing the necessary materials and resources, is the prime need.

History

Since the concept of emergency planning in government departments was introduced in 1959, Emergency Welfare Services has constituted a division of the Department of National Health and Welfare with specific civil emergency powers, duties and functions.

Function

In June 1965, the Civil Emergency Measures Planning Order (P.C. 1965-1041) re-defined and clarified the planning and operational responsibilities of the Department through the Emergency Welfare Services organization. Included in these responsibilities is assistance to provincial and municipal governments in the operation of emergency feeding, clothing, lodging, registration and inquiry, and personal services by co-ordination of federal welfare material and assigned personnel resources, advice on the priority use of essential survival resources available throughout the country, and co-ordinating welfare mutual support action between provinces and between Canada and the United States.

Organization

Headquarters

The present Headquarters organization consists of eleven senior staff positions. They include a Director, a Chief of Operations and Administration, a Continuity of Government Officer, a Chief of Services, six officers (four English and two French) responsible for the five emergency welfare services, and an Administrator. Attached administratively to federal Headquarters but functioning outside its central location are four regional representatives. They maintain liaison with the provinces and are located in Victoria, Edmonton (for the prairie provinces), Quebec, and Halifax (for the Atlantic provinces). A vacancy still exists for the Ontario position.

Regional

The responsibility for development of the program for both peacetime disasters and war emergency has been accepted by the department of welfare in every province. Each has its EWS Director and in addition some provinces have a full time EWS Planning Officer. Over one half the total number of zones across the country now have appointed and fully trained EWS Directors. Appropriate senior welfare officers have been delegated the responsibility to assist the provincial and zone EWS Directors in planning and organizing the five services. About one half of these Chiefs of Services have received the specialist training required to enable them to carry out the jobs to which they have been appointed.

Continuing Programs

The work of the federal Division concerns itself with two broad programs to assist the provinces and

municipalities to do their job. These are related to planning and organizing EWS and planning for continuity of government.

1. Planning and Organizing EWS

The Service officers act as national consultants and develop the guidelines for planning and organizing EWS. Advice is provided in the following areas:

(1) Assistance with municipal surveys to determine lodging capability and to obtain a valid national picture of the supply of used clothing in representative areas of the country. A pilot used clothing survey was conducted last year in British Columbia with the co-operation of the Dominion Bureau of Statistics. A similar one was done in Nova Scotia this year for comparative purposes. As well as testing methods, these surveys provide a sound basis on which communities can start their emergency planning.

Provinces are also progressing on the tabulation of their welfare resources which would be available in a national emergency. These include personnel, facilities and essential equipment.

(2) Stimulation and assistance with the preparation of provincial EWS plans. Provincial progress along these lines has varied depending on the degree to which key reception communities have been designated. Suggested prototypes for provincial and municipal plans have been prepared as guides to be adapted as required.

(3) At the federal level, joint planning with other departments of government, private welfare and related organizations to define policy and co-ordinate survival operations has kept pace with developing concepts of operations. Provincial EWS planners are kept informed of new and changing policies through the regional representatives and by yearly federal-provincial conferences.

Civil emergency planning with the United States over the years ensures the care of Canadian and American citizens who find themselves in the other country in time of national emergency. Participation in NATO discussions supports an exchange of ideas which has furthered international EWS planning.

(4) The interpretation and dissemination of public information is another important aspect of the total program. Recent priority has been given to ensure the availability of informational materials to English and French groups in all parts of Canada. Methods of self-help are stressed by means of pamphlets, radio scripts, television clips, and displays. Recognizing the human ten-

EMERGENCY CLOTHING
Ville La Salle Disaster, March, 1965.

dency to postpone making family and individual survival plans, reserve stockpiles of the pamphlet "Your Emergency Pack" are maintained in the regions for quick distribution to householders in case of a deteriorating world situation. During such a phase there would still be time to take some life saving action and to assemble kits of essential supplies.

(5) Operational equipment, forms and systems have been developed, tested and distributed to provinces to supplement gaps in existing resources. A total of 112 Mobile Feeding Units and 12 Mobile Clothing Sorting Units have been produced, and several provinces have added to this federal stockpile under the Financial Assistance Program. Forms and systems for the operation of EWS are strategically positioned in some provinces with the remainder being held in reserve outside Ottawa. Operational equipment and supplies can be released as needed for use in both peacetime and national disasters.

(6) A continuing EWS training program is carried on at the Canadian Emergency Measures College to keep pace with the appointments of EWS Directors and Chiefs of the five Services in key reception communities and target areas. An important new trend has been the introduction of more practical operations exercises in all EWS courses. In these exercises, candidates assume the roles that they would be called upon to perform in the case of emergency.

Federal staff also assist at provincial training courses as requested.

Two new types of courses geared to the specific planning needs of hospital dietitians and superintendents of welfare institutions have been conducted during the year. A sound institutional disaster plan can strengthen and even promote municipal survival planning. Besides being trained for their own specific emergency role, these personnel constitute a back-up reserve to the EWS organization in their communities.

EMERGENCY FEEDING
Ville La Salle Disaster, March, 1965.

PERSONAL SERVICES
Ville La Salle Disaster, March, 1965.

(7) Liaison is maintained with University Schools of Home Economics and Social Work where suitable EWS material relating to the professional curricula is incorporated. Potential leaders are thus acquiring some general knowledge of emergency procedures related to their particular skills.

(8) To assist provinces in their training programs, educational materials in the form of manuals, charts, precis, filmstrips and slides have been developed.

(9) As part of general guidance material for emergency broadcast purposes, EWS survival measures have been outlined for immediate release in the event of a national emergency.

Continuity of Government

Within the federal department, the Departmental War Book, which embodies the emergency legislation and instructions for emergency operations as well as the plan for the reorganization of the department if necessary, has been completed. The Welfare Branch of the department has participated in several telephone warning exercises to test the emergency fan-out warning system and manning procedures.

The interdepartmental working group on welfare security and disability payments completed its study and has made recommendations regarding which services should be continued in the event of a national emergency, and the means whereby these services could be continued.

A Continuity of Government Conference has been held at which every province was represented by its Director of Child Welfare and its Director of Social Assistance.

In the provinces, some have ear-marked essential records for ongoing welfare programs. Further progress can now be expected along these lines with the recent appointment of a federal Continuity of Government Officer who is available to assist the provinces in this aspect of planning.

Special Projects

1. A review of the existing Personal Services program in relation to services presently carried within the provincial departments of public welfare has been undertaken. The connection of Personal Services with the ongoing legal and social responsibilities of provincial welfare departments for child welfare, institutional care and social assistance, will be considered.
2. Since greater emphasis is being placed on the need for Emergency Measures Organizations to be ready to cope with peacetime disasters, a Working Group on EWS in Peacetime Disasters was set up by the EWS Division. The task of the Group was to study the subject of the initial emergency welfare needs of victims of peacetime disasters and of the supplies, equipment and supporting services which are required by EWS to meet these emergency welfare needs during the first 24 hours. The Working Group's Report provides a sound, objective basis for EWS planning and for possible future stockpiling requirements.

Future Plans

As the result of studies, a program of development and management for EWS has been recommended to provincial welfare departments. Priorities have been suggested on the basis of probable risk and relative importance of each of the five emergency welfare services. A sample five year plan for the development of EWS within the departments of welfare has been presented to each province for consideration. This suggested guide can be adapted by provinces to meet their particular needs, if necessary. These steps should result in better balanced EWS organizations in the regions at the end of the five year period.

REGISTRATION AND INQUIRY
Ville La Salle Disaster, March, 1965.

Conclusion

This discussion would not be complete without an acknowledgement of the tremendous assistance given by public and private welfare agencies during recent disasters. Their spontaneous generosity proves the need for all governments and agencies to work together productively at such times. The responsibility remains, however, with government at all levels to provide the organization, leadership and capability to provide Emergency Welfare Services.

With this responsibility always in mind, the federal EWS Division will continue to provide guidelines for operational policies and uniform procedures, to train the key personnel selected by the regions to do the jobs involved, and to supply some of the necessary tools. ▲

THE ROLE OF COMMUNICATIONS IN CIVIL DEFENSE

by

Harry E. Roderick, Chief
Communications Operations Branch
Office of Civil Defense, OSA

ADEQUATE and effective communications are an essential, indispensable element for emergency survival. All civil defense actions keyed to warning are dependent upon communications. Without effective communications, maximum utilization cannot be made of fallout shelters and other emergency survival measures. Essential survival instructions will be given to the public by means of the Nation's emergency radio broadcast system. It can be seen that the role of communications in any emergency, natural or man-made, is vital to the saving of lives and property.

An attack on the United States could seriously disrupt communications within and among Federal, State, and local governments, industry, and the public. Therefore, civil defense must plan for the continued operation of essential communications services using protected locations during a fallout environment. Essential communications include those for warning, command and control, damage assessment, broadcasting survival instructions to the public and the accomplishment of other survival functions by recognized governmental authorities.

The Federal Government must provide the leadership, guidance, and assistance needed to help State and local governments, as well as key industries, to meet their essential emergency communications obligations. Measures must be taken to protect physical property, operating personnel, and management from the effects of attack.

In order to provide vital communications in any emergency, proper planning for the best utilization of available facilities is necessary. This involves the joint efforts of Federal, State, and local governments, as well as the cooperation of the communications industry.

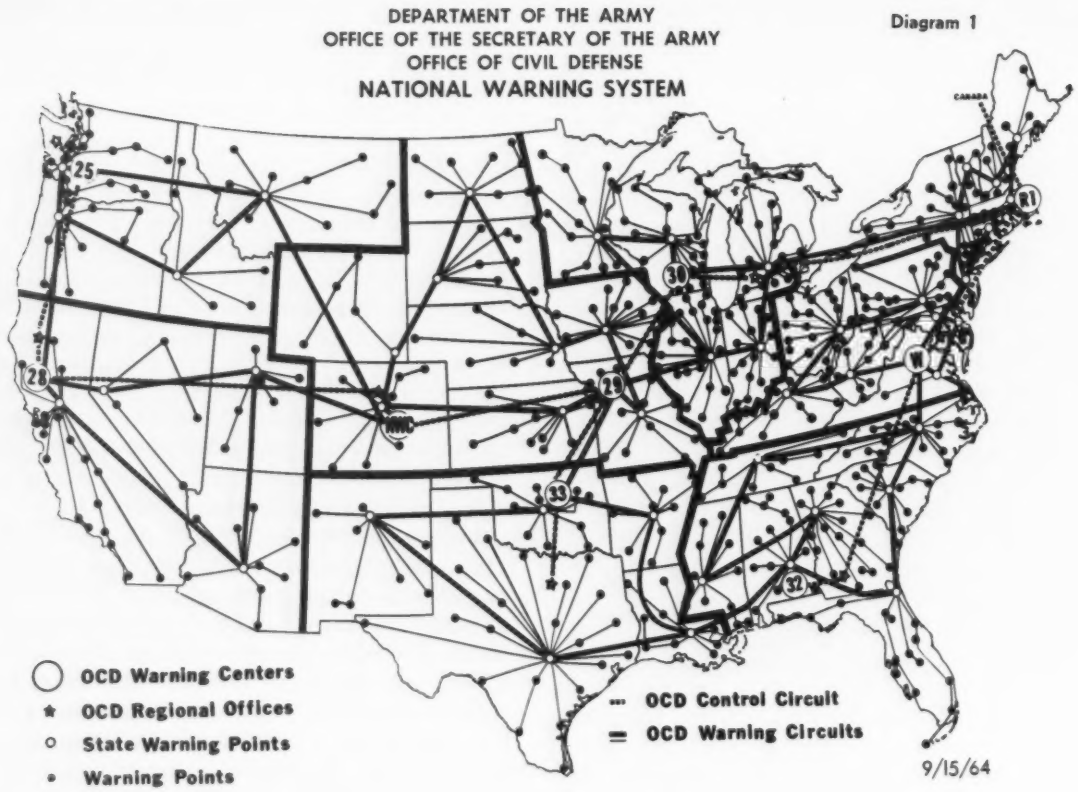
Under the authority of an Executive Order the Federal Communications Commission (FCC), subject to policy guidance of the Office of Emergency Planning, is responsible for the preparation of emergency plans for essential communications during conditions of national emergency involving the use of common carriers, broadcast facilities, and the public safety and special radio services. The Office of Civil Defense (OCD) provides the requirements and represents the ultimate operational users at the State and local levels. Under FCC's guidance, industry advisory committees made up of representatives from the communications industry are formed at National, Regional, State, and local area levels to assist FCC and civil defense in fulfilling its respective emergency communications responsibilities. Industry and governments plan jointly to meet the operational needs of a national emergency.

Since the OCD is a part of the Department of the Army, all Federal civil defense communications requirements are now a responsibility of the U. S. Army Strategic Communications Command. Many operational communications functions at OCD National Headquarters and our Regional Offices are in process of being assumed by Department of Army units. Under a new concept of a future National Communications System (NCS), all Federal Government communications systems will be combined to provide maximum flexibility and capability for emergency interconnection where needed.

OCD is directly concerned with the establishment and operation of four principal communications —NAWAS, NACOM 1, NACOM 2, and EBS. A brief explanation of each communications system follows:

NAWAS

The National Warning System is the Federally-provided voice communications means for warning the civilian population in the event of an enemy attack. This system has other secondary uses, such as rendering of aid in natural disasters, reporting of downed aircraft, reporting of nuclear detonations, and radiological fallout data. NAWAS can be used to provide limited command and control capabilities. It is supervised at selected OCD Warning Centers, where information provided by the vast NORAD detection and surveillance system is available for civil defense use. NAWAS extends to over 900 strategic locations throughout the country known as warning points, and includes over 45,000 miles of circuitry. It is the most extensive network of its kind in existence. It is maintained at all times on a wartime readiness. Separate systems are available for warning Hawaii, American Samoa, Guam, Puerto Rico, and the Virgin Islands.



State and local warning systems extend warnings to virtually all recognized communities and their civilian populations. OCD provides technical guidance and financial assistance for these systems.

Local warning consists of outdoor systems in densely populated areas utilizing sirens, horns, whistles, or public address systems. Indoor warning systems are needed to supplement outdoor systems and extend warning throughout areas where outdoor systems are not practical. Although equipment is available for warning key officials, industries, and services using bell and lights, group alerting, wired-music facilities, special radio alert receivers, etc., there is no effective and reasonably low-cost means presently available for indoor warning to be given to all people throughout the country.

A continuing study has been underway by OCD to determine the feasibility of utilizing the power networks (NEAR), the telephone system, or radio facilities—or some combination of these—to provide needed individual alerting and warning. With the discontinuance of CONELRAD, studies indicate that radio systems may provide an indoor alerting and warning capability at a considerably lower transmitter modification cost than required for the power line NEAR converters. The voice feature is most important for validation and immediate reassurance if there should be a false activation of the system.

OCD is continuing, on a priority basis, the development of an effective indoor warning device through studies by industry and the establishment of test systems. We hope to provide maximum warning capability for all people to meet the threats of a missile age.

NACOM 1

The Civil Defense Telephone and Teletype System known as NACOM 1 is a commercial system provided by the Federal Government to interconnect the OCD National Headquarters, and OCD relocation point, Regional offices, and State civil defense offices for the exchange of operational information and instructions. This system utilizes the trunk circuits of the military Defense Communications System (DCS) and the CONUS AUTOVON.

The teletype network is full duplex (simultaneous send and receive) 100 words per minute system. The National/Regional portions are capable of accepting KINEPLEX data (3,000 bits per second or approximately 4,000 words per minute).

State authorities are expected to extend this system to all local entities within their respective borders through plans developed in conjunction with State Industry Advisory Committees (SIAC) for the utilization of available communications facilities and services, or through special facilities obtained through the Federal contributions program.

NACOM 2

The Civil Defense Radio System known as NACOM 2 is a high frequency single sideband radio network utilizing voice, code, and radio teletype techniques. Its purpose is to provide an emergency backup capability to NACOM 1.

The Regional network terminals use 2½ kilowatt transmitters and associated receiving equipment. State installations consist of 500 watt transceiver-type equipment. The system is designed for ready expansion by additional installation of antennas and other specialized equipment. Twenty-four States and Puerto Rico have NACOM 2 operational capability with equipment being provided to add 18 more installations this fiscal year. The procurement and maintenance of all of this equipment is a responsibility of the U.S. Army Strategic Communications Command.

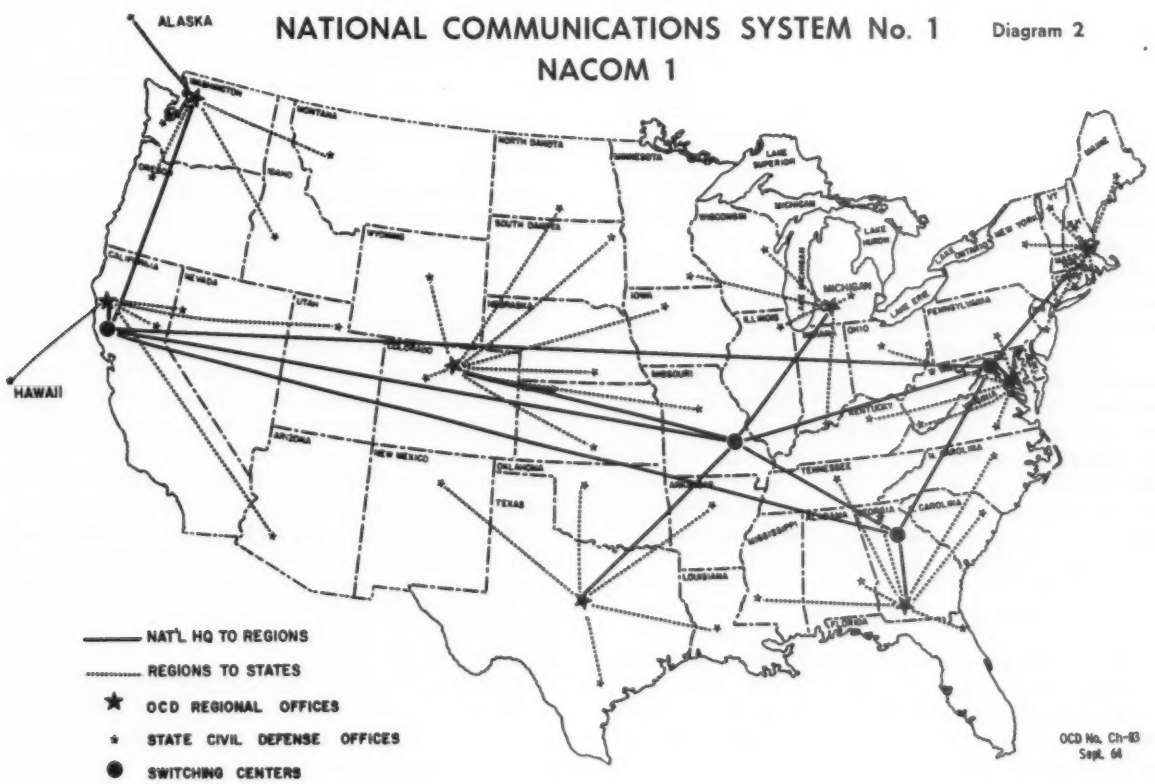
EBS

The Emergency Broadcast System is the system developed by the Federal Communications Commission in conjunction with OCD to provide the President, the Federal Government, and State and local authorities a means of communicating with the general public through nongovernment radio broadcast stations during preattack, transattack, and postattack periods. Participation in EBS is voluntary, and only those radio stations that agree to meet the special requirements are issued a National Defense Emergency Authorization (NDEA) by the FCC. Each authorized radio station operates at its assigned frequency and normal power. The National EBS Plan became effective on January 6, 1964.

All States have developed EBS Plans and are in various stages of implementation. State EBS Plans consist of two portions: (1) a plan for State programming by air to air relay, utilizing FM and/or TV (aural) stations, and (2) a plan for EBS operational area programming by State districts, metropolitan area, local governments, or combinations of local governments. Existing commercial broadcast patterns surrounding metropolitan areas or groups of communities within the State may be the basis for such operational areas.

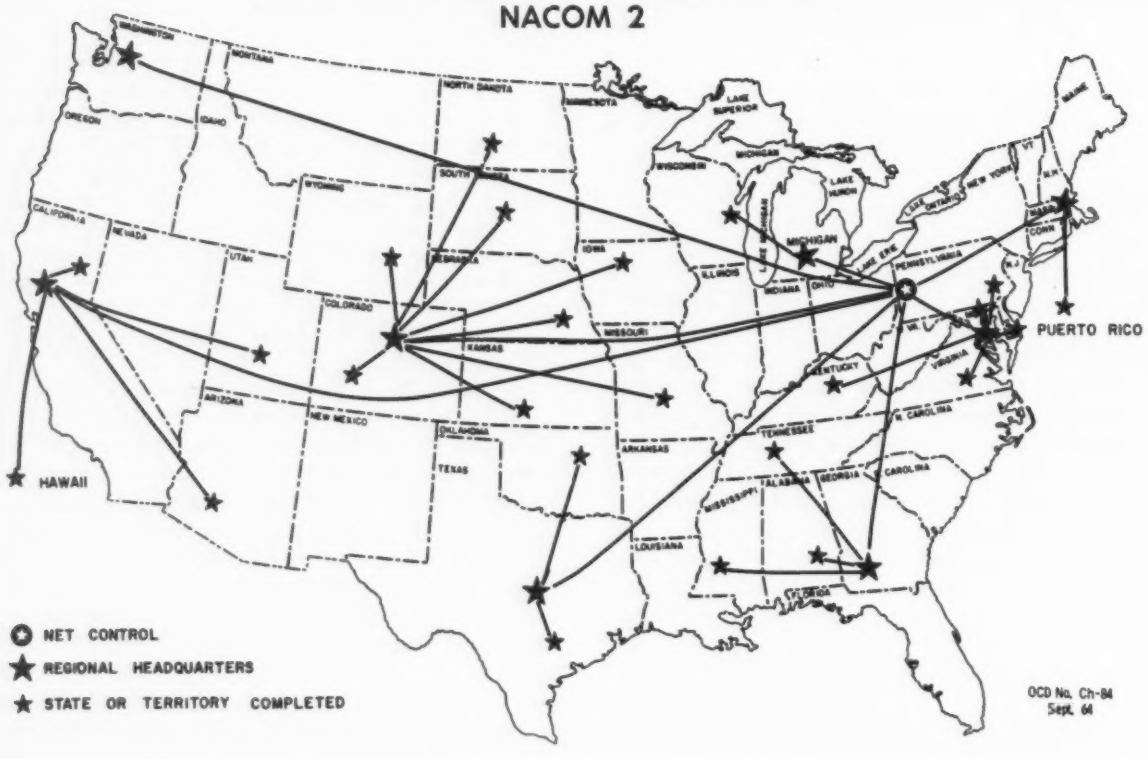
NATIONAL COMMUNICATIONS SYSTEM No. 1 Diagram 2

NACOM 1



NATIONAL COMMUNICATIONS SYSTEM No. 2
NACOM 2

Diagram 3



In the event of an Emergency Activation Notification for the EBS, OCD Warning Centers can transmit this order over a special interconnection, capable of seizing and combining the Associated Press and United Press International news teletype systems that extend to approximately 4,500 AM, FM, and TV broadcast stations throughout the country.

In order to increase the probability of selected radio stations in EBS maintaining operations during a fallout environment, OCD has taken special measures. These stations are provided austere fallout protection for minimum operating staff, emergency generators, associated emergency equipment, and radio links to civil defense emergency operating centers for programming. Six hundred fifty-eight radio stations are to be protected with 540 already selected. When completed it will provide national and State government programming capability and selected population center area programming during a fallout environment.

State and Local Communications

The Federal communications capabilities provided by NAWAS, NACOM 1, and NACOM 2 must be extended by State governments to all political entities throughout the State. Here major OCD effort is concentrated to assist State and local authorities to: (1) inventory existing communications systems, (2) determine their civil defense operational communications requirements, (3) match the inventory against requirements, (4) take actions to correct deficiencies, and (5) prepare new operational plans and procedures.

As our civil defense program is fallout shelter oriented, more emphasis must be given to the protection of existing communications facilities. Federal guidance has been provided to the communications industry to encourage measures to increase its fallout protection or relocate equipment to areas within buildings having an adequate protection factor. Indications are that adequate communications exist in most areas to meet essential emergency civil defense needs. Proper planning and interconnection capabilities between systems will provide maximum reliability and flexibility.

In summary, emergency communications can be divided into three categories: (1) government to government for command and control, (2) government to people which involved our EBS and various means of warning, and (3) people to people. Although most of our time and effort is being spent on the first two, industry through our common carrier facilities will provide the third.

Many of our problems in emergency communications are similar and through continued mutual exchange of ideas and assistance, we can both improve our civil defense readiness posture for any emergency that may occur. ▲

THE ARCHITECT'S ROLE IN CIVIL DEFENCE

Excerpt from a thesis "THE ARCHITECT'S ROLE IN NUCLEAR DEFENCE" *by Mr. C. R. Thompson, B. Arch., reprinted from the New South Wales Civil Defence Bulletin.*

The architect's role in nuclear defense is to assist in reducing national and individual vulnerability to death and destruction. In terms of buildings the most important factor brought out in this thesis seeks to bring to light the realization that effective vulnerability reduction can be achieved. Architects must cease to be sceptical and realize that not only is vulnerability reduction possible but that they have an important role in a vulnerability reduction programme.

The architect's role is to:

1. Act as an instigator and leader of vulnerability reduction programmes.
2. Provide physical protection.
3. Plan for rapid post-war reconstruction.

The line of demarcation between the professions of architect and townplanner is so vague as to result in a common role. The architect is not just responsible for individual buildings, but must accept the responsibility to total architecture of cities, building masses, interflowing spaces, access, location, servicing and other vital aspects in planning for human environment on the individual and mass levels. This responsibility of the architect places him in the same position as the architect of the Renaissance and other ages, when he was expected as part of his normal duty to the client and the community as a whole to reduce the vulnerability of inhabitants of his designs to a minimum, from dangers of war. This results in all buildings being regarded as public buildings and this is an essential consideration in planning for overall vulnerability reduction. The design of public buildings is not simply a matter between architect and client—because at the cost of millions of pounds each year, the architect is doing something to a city, a community, which will affect its face and its effectiveness for at least half a century.

We often hear of the medical profession speaking as a whole against smoking because of cancer danger and the dental profession advocating fluoridation. These are professional groups carrying out their community responsibilities. The architectural profession must be heard on problems of cancerous urban and suburban growth which raise social and vulnerability problems of unprecedented scale. He must advocate the provision of an overall plan to reduce vulnerability to modern warfare. This must be done in public and as a professional group with the intention of bringing the majority of citizens out of their present state of apathy and exerting pressure on civil authorities, in particular the State, to introduce standard and effective requirements of protection.

The profession as a corporate entity, must give leadership in public, rather than purely intra-professional discussion of these matters. By exerting pressure on the State, attack is being directed at the major individual constructor in the community. The State, through its construction of housing, schools, hospitals and other public buildings, is in a position to mould public opinion towards acceptance of the realities of the vulnerability predicament. The Swedish Government has formulated building regulations which insist that shelter facilities, to at least minimum government standards, be placed in all residential buildings and other major buildings, particularly those holding large concentrations of people. This programme, which placed the responsibility for construction on private as well as public builders, does not appear to have bankrupt Sweden. The United States Government has recently decided to set an example to private enterprise, rather than compel, to provide shelter facilities. They are doing this by establishing shelter facilities in all suitable federal buildings for both military and civilian use. Sweden has prepared a programme which is expensive and still relies on evacuation planning as a major safety measure. Despite flaws in the Swedish programme, the Swedish Government has carried out its responsibility to safeguard its citizens as effectively as possible.

The adoption of pressure group tactics by the architectural profession may be looked upon with distaste by many members, but personal discomfort must be accepted, if necessary, to carry out civic duties.

Quite apart from civil defence organizations' research into technical requirements for protective measures, the architect and his profession must carry out their own research. The physical structure of cities needs re-analysing to discover densities of population, the amount of protection provided by existing structural and topographical features, the resistivity of these structures to blast and heat, the inflammability of the various parts and methods of construction and, in general, an estimate of present vulnerability. Considerable civil defense research material is now available for evaluating city vulnerability.

With this information the architect will be able to assess the amount of protection needed in buildings both new and existing.

The American Institute of Architects, in conjunction with civil defence authorities, has organised design competitions among members to show that protection can be provided in efficient, attractive buildings as an integral design element. The U.S. Office of Civil Defense Mobilization consults groups of architects to provide designs as can be seen in hospital, school and factory designs shown in this thesis.

Architectural organisations, such as the Royal Australian Institute of Architects, should modify their structure to provide facilities to develop prototype schemes by architect members. Within such a reconstructed professional framework, research into problems of design materials, building techniques and a multitude of matters which will readily occur to architects will be of major importance and will become a matter of practical and economic possibility.

The present structure of the building industry has as its leader, the architect, followed by his consultants and contractors. This professional relationship must be expanded to include protection proposals with each of the consultant groups playing his part under leadership of the architect.

Once a fully balanced protection programme is adopted the architect is then deeply involved in protective construction and environment. He must work closely with town planners in endeavouring to reduce population density. The primary source of vulnerability from the point of view of military strength and civilian safety is the existence of large industrial clusters and high density housing and commercial concentrations, both associated with major urban areas. These urban areas at present provide insufficient shelter from the deadly properties of nuclear explosions. An additional source of danger is the vulnerability of services and establishments which would be needed to provide relief; hospitals, fire fighting organisations, etc. The technological advances made in manufacture and delivery of nuclear weapons now threatens the whole of suburbia around the urban centres, endangering houses, food, medical and water supplies, utilities necessary for survival in the stricken area, factories, equipment and personnel needed for post-war reconstruction.

The architect must be competent in protection design to provide the necessary modifications to present structure of buildings and urban design. Provision of physical protection, although centred around shelter design, is not limited to this alone. The architect-town planner must endeavour to encourage decentralisation, in the form of satellite towns and cities placed in a safe locational pattern, within the region surrounding a mother city. Satellite towns in a safe locational pattern are an ideal form of vulnerability because the physical danger to the city structure is considerably reduced. Radiation danger is also considerably reduced. Survival of city structure is the first step in comprehensive protection. Within satellite communities there is every possibility of designing buildings to remain standing during attack unless the satellite town itself is attacked. New towns like the mother city need to be limited in size of site cover and population. Every endeavour must be made by the architect to encourage inhabitants to live in tower blocks and modified terrace housing rather than in the vulnerable conventional suburb. Use can be made, by the architect, of topography, distance, materials and buildings to protect the inhabitants. Scattered concentrations throughout a region lower overall city population density and provide centres for less expensive shelter requirements.

Our cities are ripe for large scale urban renewal because many areas have become obsolete, inefficient and uneconomic in their present capacities. Architects designing these large renewal projects are in a position to provide maximum protective planning. Inner suburbs are also reaching the point of obsolescence and at present are being rebuilt piecemeal with home-units, flats and industry. These new high-density areas must be provided with protection; if not the buildings themselves, then in the form of shelters for occupants.

Physical protection becomes vital within urban and suburban areas. The architect must be able to design shelter for varied circumstances. Evacuation is a dubious proposition to rely upon because of the danger of surprise attack so that the urban and suburban populations must be considered potentially immobile. Physical protection is the only solution to the problems under this circumstance. Shelters must be more than the World War II shell containing bench seats, but be a home for periods of a fortnight or more. The technical requirements are outlined in this thesis primarily from civil defence research material but considerable attention must be given to environmental design. The architect must be familiar with the problems of communal living under frightening conditions. He must acquaint himself with methods of preventing panic and psychological destruction of survivors. Use of colour, subdivided areas, light, acoustics, surfaces, materials, atmospheric and social facilities are only a few of the requirements needed in long term shelter.

The aim of finding a choice other than evacuation or deep underground shelters or equivalent cannot be achieved in urban and near ground zero suburban areas. In fringe areas where blast and fire no longer become dangers and reduction in radiation is appreciable, consideration of reduced protection is feasible, natural light and ventilation and a greater sense of normality are possible, as shown in the A.I.A. prize winning school by Brian Crumbish. Efficient, attractive buildings can be designed to include protection as an integral design element and is a simple, low cost practicability if a requirement of the architect's initial programme.

The use of dual purpose shelters is the obvious method of initiating protection at least cost and maximum efficiency. Provision of dual purpose designs will be the major weapons to be used in breaking down resistance from clients, the State, and the general public.

The architect, when possible, must make provision for restoration of normality after a disaster. Little can be done in near ground zero areas to protect buildings and plant other than moving underground or using construction of astronomical expense above ground.

(*Continued on page 19*)

ONTARIO AUXILIARY POLICE

Report by Ontario Emergency Measures Branch

A great deal could be said about the Auxiliary Police activities in many centres in Ontario. This article deals with the two largest police forces in Ontario, the Ontario Provincial Police and the Metropolitan Toronto Police Force.

The Ontario Provincial Police

The years have brought many changes since the Ontario Government appointed John Wilson Murray in 1877, to act as a "detective" to pursue criminals and "run them down" in their havens of refuge. When silver ore was discovered in the Cobalt area and gold ore in the Porcupine territory, the resulting lawlessness made the Government realize that more adequate law enforcement measures were required. Consequently an Order-in-Council, dated October 13, 1909, provided for the establishment of the Ontario Provincial Police Force, comprised of between 45-50 men with Major Joseph E. Rogers as Superintendent in Command.

The 3,600-man Ontario Provincial Police, a "Crown Force", is the third largest deployed Force in North America.

The most sweeping reorganization the Force has ever known began in 1963 with the appointment of the present Commissioner, E. H. Silk, Q.C. Significant changes have occurred in equipment, personnel, selection, training, administration, investigative specialization and promotional procedure—all designed to elevate the Force in its role as one of the major weapons in the fight against crime and maintaining of law and order within our province. Today the force has an authorized strength of over 3,600 uniformed and civilian personnel, all of whom are administered from General Headquarters Toronto. With this establishment, the Force maintains 238 detachments in 17 districts across the province, of which 36 municipalities are policed under special contract. A fleet of over 950 mobile units, including cars, motorcycles, trucks, jeeps, boats, aircraft and snowmobiles, is used to provide service to the residents of Ontario.

In 1954 approval was given by the Provincial Secretary for the formation of Provincial Civil Defence Auxiliary Police. The auxiliary Force was recruited on a county system under the direction of a senior officer of the Ontario Provincial Police.

On April 1, 1960, the EMO Planning Committee (Deputy Ministers of Government Departments) considered that the Provincial Civil Defence Auxiliary Police should be discontinued and reorganized, to be more closely allied with the Ontario Provincial Police. The Provincial Civil Defence Auxiliary Police became Auxiliary O.P.P., under the general control and administration of the Commissionner.

The function of the Auxiliary Police is to augment the regular Force in an emergency. Where there are not sufficient members of the regular Force to cope with a special occasion, the Commissioner may authorize auxiliary members to perform police duties and while so authorized an auxiliary member becomes a constable and has authority to act as a constable of the Force.

The Auxiliary Units come under the Field Division and there are 17 Units located across southern Ontario. Each unit has a complement of 32 all ranks, made up of 1 Inspector, 1 Sergeant, 3 Corporals and 27 Constables, making a total of 544. The Units operate in conjunction with regular O.P.P. Detachments and are under the direct control of the District Superintendent.

Members of the Auxiliary are recruited from all walks of life. The standards for height and weight are the same as for the regular Force. Each Auxiliary member is appointed under authority of the Police Act for Ontario pursuant to the Public Service Act.

Auxiliary Police training is continuous under the direction of the regular Force Corporal at the detachments where the Auxiliary Units have been established. The Auxiliaries meet twice monthly and receive lectures on the Criminal Code, The Highway Traffic Act, Liquor Control Act, and many other varied subjects conducive to police training. Each Auxiliary member must take and qualify for a St. John Ambulance First Aid Certificate. Cruiser training is also a part of the course of instruction. Members of the Auxiliary engage in routine patrols on a regular basis with members of the regular Force.

The Auxiliaries assist the regular Force on many occasions, at parades, fairs, traffic control at accident scenes, searches for wanted and missing persons and many other events.

As a result of their excellent work the Auxiliary O.P.P. are an asset and credit to the regular Force.

Commissioner E. H. Silk inspecting O.P.P. Auxiliary Police Unit at Port Credit, Ontario.

Metropolitan Toronto Police Force

In all city activities where Crowd Control is needed the Auxiliary Police uniform is much in evidence, assisting the regular police in the performance of their duties.

It is interesting to note in the recent graduation of Police recruits the best cadet was a young man who had served as an auxiliary policeman, and it is from these auxiliaries the regular force have acquired several top-notch recruits for the force.

The Metropolitan Toronto Auxiliary Police is a section of the Uniform Branch of the Metropolitan Toronto Police Department, comprised of citizens from the Metro Area, who have volunteered their time and services to assist the Department in times of need. Members of the Auxiliary Police receive no form of remuneration for their services, however, on completion of their training they are uniformed and equipped at public expense, through the Financial Assistance Programme of Emergency Measures.

In 1954-55, the Auxiliary Police came into being in the Metropolitan Toronto area as a part of what was then known as the Civil Defence Organization. It soon became apparent, however, that a uniformed force so closely allied with the Police Department could not properly function while serving under two masters, (the Department on one hand and the Civil Defence Organization on the other) so in June 1962, under the provisions of the Emergency Police section of the Ontario Police Act, the Metropolitan Board of Commissioners of Police assumed full responsibility for the Auxiliary Police Force and its management. At the direction of the Board of Commissioners, the Auxiliary Police as it exists today was then established, with all training and control of the unit being given to the Uniform Branch of the Metropolitan Toronto Police.

There are at present some 600 plus active Auxiliary Police Officers in the Metropolitan Toronto Area. This number is divided into 5 District units, a Traffic Branch and a Policewomen's Bureau. Each district unit being under the direct responsibility of the respective Superintendents of the Metropolitan Police, while the Traffic Branch is controlled directly by the Deputy Chief (Traffic), and the Policewomen directed by Inspector Fern Alexander, Officer Commanding the Regular Metropolitan Police Women's Bureau.

Currently on active strength in the Auxiliary Police are: 1 Senior Inspector; 7 Inspectors; 18 Sergeants; 30 Patrol Sergeants and approximately 600 Auxiliary Constables and Policewomen. During 1964 these officers gave over 18,000 hours of actual "on duty" service to the Department and the Community at various parades, special functions and general police duties.

Anyone wishing to become an Auxiliary Police Officer must first meet certain standards of age, height, and weight, and then upon application for submission, will be required to attend a personal interview before a Selection Board comprised of Senior Officers of both the Auxiliary and Regular Police Forces. If accepted by the Selection Board, a recruit then be assigned to one of the training centres for Auxiliary Police to commence his formal training. There are three Auxiliary Police Training schools located conveniently in the East, West and Central portions of the Metropolitan Area, providing opportunity for the recruit to undertake the minimum amount of travelling while completing his period of training. The course of study given in these centres involves a period of some 32 weeks duration, on the basis of one night per week. During this time, the recruit is given training in a wide range of subjects such as, The Criminal Code, the Highway Traffic Act, the duties and powers of a Police Officer, Restraining Holds, Water Safety, St. John Ambulance First Aid, and certain other allied subjects. Written examinations must be passed on various segments of training, and upon completion of the training course, the recruit is then uniformed and sworn in as a Special Constable, at which time he is assigned to one of the existing units of the Force. As a full-fledged Auxiliary Police Officer, the recruit is then expected to attend his unit meetings (usually held on a twice-monthly basis) where his training is continued on a more advanced scale. In addition to this activity, he is also expected and required to serve eight hours of duty per month in the company of a Regular Police Officer on Scout Car or Foot Patrol, as well as attending special events as he may be called upon to attend.

It should be noted that although normally an Auxiliary Police Officer has no more authority or power than the average citizen, when he is called out on duty by the Chief of Police he is equipped with full police authority for the duration of such duty. ▲

Graduation and swearing-in ceremonies of Metropolitan Toronto Auxiliary Police.

NORTH AMERICAN AIR DEFENCE (NORAD)

The following extracts are from a presentation to the Annual Conference of the California Civil Defense and Disaster Association by the NORAD Briefing Team. The presentations were given September 17, 1965.

NORAD is the organization with the job of defending Canada and the United States against aerospace attack. Unlike strategic units, which would strike enemy forces not yet launched into battle, NORAD would defend against an enemy already on its way to North American targets. Their task, therefore, is to defend some 10½-million square miles of North American territory 24 hours a day, 365 days a year.

NORAD'S MISSION

by

FLIGHT LIEUTENANT LEONARD G. JENKS
Royal Canadian Air Force

NO MILITARY FORCE is brought into being without a reason for its existence, nor is its mission just a matter of checks. You are all aware of the communists ideology and of their announced threat to dominate the world. To prevent this from happening, to combat these forces against us is the job of NORAD, but more specifically stated, the mission of the North American Air Defense Command, is to defend the North American continent against aerospace attack. The key words here are to defend, for unlike our counter offensive forces whose mission it is to strike those enemy forces not yet launched into battle, NORAD's mission is to defend against those forces that are already launched and en route to their targets on this continent. NORAD's task, therefore, is to defend 10½-million square miles of the North American continent against hostile weapons in a hot war and to effectively police this same area against potential enemy over flights during the cold war. We do this 24-hours a day, 365 days a year.

Just to show you what has happened in NORAD from time to time, I have two typical reports from the news media that perhaps you have seen. After quoting the news release we will then take a look at NORAD's operations behind the scenes, the parts that did not get into the news. First of all, United Press item, dateline October 2, 1963, Washington, D.C. "Yesterday a flight of long range Soviet bombers approached to within a few miles of the north coast of Alaska and then flew parallel to the coast for more than one hour before returning to the Russian mainland." So much for our first news release. Now for NORAD's actions in this case. On that morning of October 1, the RADAR station located on Barter Island on the Arctic ocean reported a flight of aircraft approaching their station from the direction of Soviet, Siberia. Minutes later, using flight plan correlation, the Alaskan NORAD Sector had determined that no known aircraft were operating at that reported location. They were, therefore, declared unknowns. In five more minutes three armed F-102 Delta Dagger fighter interceptors on five minutes alert at an Alaskan air base were scrambled to intercept that flight. Sometime after take-off, following the instructions at the RADAR Direction Center, the F-102's had intercepted the flight some miles out over the Arctic ocean. There they identified them as Soviet "Bear" type heavy bombers, took photographs, and assumed flight position for continued surveillance. These Soviet aircraft shadowed by the F-102's approached to within 25 miles of the Alaskan coast, then turned west and paralleled the coast for about 10 minutes before turning back towards the north—towards Russia. The F-102's then returned to their base, the Barter Island RADAR station continued surveillance of the "Bear" aircraft until they had disappeared from their scopes. No actual penetration of North American aerospace had in fact taken place, but just in case, NORAD was prepared.

Our second news release is from the Soviet News Agency—TASS—as released to the World Press from Moskow last October 6. "The Soviet Union today launched into orbit the 47th of a series of unmanned space satellites designed to prepare the way for additional man flights. This latest space vehicle nicknamed Cosmos 47 carried radio transmitters and radio telemetric equipment to relay its findings back to earth." So much for our second news release. Now for NORAD's actions in this case. On the morning of last October 6, the ballistic missile early warning station located at Tule, Greenland reported that an unidentified object had been launched shortly before from within the Soviet Union. In less than a minute after the initial report, the computers of the BMEWS system after performing a rapid projectory analysis, reported that this object was not a missile that would impact upon North America, but was in fact a satellite destined to orbit around the earth. Upon receipt of this latter information the NORAD Space Defense System, or (SDS) as it is better known, notified its worldwide network of Radio, RADAR and optical sensors of the space shot and its predicted orbit. In a short time the SDS had verified the orbit of the satellite. Had predicted its apogee at 192 miles, its perigee of 88 miles and forecasted future orbital patterns. After the satellite orbit had been verified, the optical sensor station operated by the RCAF at Cold Lake, Alberta, had

taken a photograph of that satellite. Information gained from the photographs were immediately transmitted to Colorado Springs for evaluation and analysis. But the interesting point to remember in this case is that all of this occurred some hours before any announcements from Russia that they had yet launched that satellite. Incidents similar to these occur from time to time—some are reported in news media, some are not. Some concern Soviet submarines operating off our coast, some concern Soviet air transport flights going to and from Cuba and some concern unknown aircraft approaching our shores. All of them are of interest to NORAD, for we are in the defense business.

The primary concept of any defense strategy is that it must be based upon and be specifically equipped to counter the offensive capabilities of an enemy. So what is the enemy capability in terms of actual weapons. What is the threat that we must defend against. Well, these are the weapons systems in being today. First of all we will consider the Russian bomber system with a sizeable inventory of fairly high performance aircraft. They currently possess two general types of aircraft. Subsonic, medium and long range types, and supersonic high gas speed types. Their development and operational employment of the air to surface missile commonly referred to as the Standoff missile has convinced NORAD that the bomber is still an efficient and effective weapon wystem and will so remain for at least a few more years to come.

Intelligent sources also tell us that the Soviets have now for some time been doing research and development in the field of supersonic bombs. This is evidenced by the appearance of two bombers—both having a supersonic capability. The first is called the "Blinder"—it has a swept wing design with twin engines mounted externally near the tail. This is the medium bomber. The other new aircraft that we have seen but not in squadron service is code named the "Bounder". It has a Delta wing design and is somewhat similar to SAC's B-58.

Until not too many years ago the bomber force was the only means that the Soviets had available to launch an attack on this continent. Now, however, the ballistic missile has a very important place in the Soviet arsenal. There are two types of ballistic missiles which are of specific interest to NORAD. The intercontinental ballistic missile (ICBM) and the submarine launched ballistic missile or (SLBM). First of all we will consider the ICBM. It is an area weapon that depends upon high yield destruction capacity rather than very great accuracy. It is, however, a very long range weapon and it is very difficult to intercept and destroy. The Soviets presently possess what we would call a modest force of ICBMs. They have fewer ICBMs than does the United States, but their force is expected to increase appreciably throughout the next two years. Fortunately, we have been able to follow the progress of the Soviets in this field from their tests into the central Pacific. Here they have clearly demonstrated to us their capability of sending ICBMs distances in excess of 6,500 nautical miles. As you can see this is enough range to cover North American targets from deep within their own land area.

Next is the SLBM or sublaunched ballistic missile. We do know that the Soviets possess a sizeable submarine fleet. And as portions of this fleet are converted, or as new submarines are constructed to improve this capability—we might expect this threat to increase.

No discussion on the Soviet threat would be complete without taking at least a quick look at their space programs. Their current space activities appear to be in the field of exploration of near space and of the early attainment of sophisticated man space flights. Throughout the past few years they have clearly demonstrated their capability of launching heavy payload earth satellites.

Thus, very briefly we have reviewed for you the evidence at hand. The Soviets have a capability for an attack on this North American continent inasmuch as they have a bomber force with its family of air-to-surface missiles as well as bombers. They have an increasing capability to attack our coastal areas to a depth of several hundred miles with sublaunched ballistic missiles. They have increasing numbers of intercontinental ballistic missiles and certainly they have the technical know-how to launch heavy payload satellites for possible military uses. NORAD is charged with defending the North American continent against any and all of these weapon systems so let's now take a look at how we are set up to accomplish the task—that is the organization of NORAD.

Military planners of the United States and Canada realized several years ago now that the threat to this continent was a single problem and not separate problems of the two nations acting independently. The conclusion that the integration of Canadian and American aerospace defense forces was necessary led to the establishment of NORAD in September, 1957. At that time the operational control of Continental United States and Canadian Air Defense forces was vested in a single international commander, Commander in Chief NORAD.

The some 170,000 personnel of approximately 400 locations over the continent which make up the integrated forces under the Operational Control of the Commander and Chief are furnished by three military component commands, they are: The Royal Canadian Air Force Air Defense Command; United States Air

Force Defense Command; and the United States Army Air Defense Command. In addition the Commander in Chief, Alaskan Command, a separate United States Command, is responsible to the Commander in Chief NORAD for the aerospace defense of Alaska.

In its organization NORAD is unique in some respects. First of all the commander in chief, General Struther is responsible to both the Canadian Minister of national defense and to the United States Secretary of Defense. Through the Canadian Defense staff, through the United States Joint Chiefs of Staff. Second, by terms of agreement between the United States and Canada, the Commander in Chief and Deputy Commander in Chief cannot be from the same country. Since General Struther is the United States Air Force Officer, his deputy is, therefore, a Canadian; Air Marshal Dunlap, in the absence of General Struther has complete authority over all NORAD forces, American as well as Canadian.

In exercising operational control over these various component forces, NORAD has divided the continent into eight geographical regions. Each region has its own air defense commander and its own headquarters. Six of these regions are numbered, the remaining two are simply called Alaskan NORAD Region and Northern NORAD Region. Most of these regions are then further sub-divided into Sectors. The number of sectors is determined by the amount of air traffic and by the number of vital targets located within that particular area. For example, the 30th Region in the midwest has two Sectors, but in the highly industrialized northeast again, the 25th Region has four Sectors allocated.

This operational organization is all tied together by a system of command and control, consisting of the Combat Operations Center at NORAD headquarters in Colorado Springs, the Combat of the NORAD Regions and the Direction Centers of the NORAD Sectors. At the Combat Operations Center at NORAD headquarters, the threat is evaluated, a state of emergency is declared, civil and military action is coordinated and the overall air battle is monitored. Each region commander in turn is responsible for the defense of the area under his control. He monitors and coordinates the air action, he plans the full use of the assigned forces and he supervises the methods, tactics and procedures by which an air battle is fought. The Sector Commander then is responsible for fighting that air battle. He must engage in enemy and commit the weapons.

In summary then, ladies and gentlemen, the organization of NORAD is quite plain, it is a two nation command, it is jointly manned, each member in NORAD has the task of defending North America against aerospace attack.

DESCRIPTION OF NORAD'S OPERATION

by

MAJOR H. A. DAVIS, JR.
U.S.A.F.

The threat portion of our briefing which Flight Lieutenant Jenks has given you identified those enemy weapons systems against which we must defend. So we would like now to show you how we provide that defense, how we do our job. These are NORAD's operations.

First of all, three basic requirements for air defense must always be satisfied and these are: to detect, to determine intent, and if warranted—to destroy the object that penetrates our surveillance area. Although these three basic actions apply to all aspects of aerospace defense, the ways and means of their execution vary with each of the categories of threat.

Let's first of all take a look at the man bomber threat against our original requirement—detection. Since the man bomber threat has been with us the longest, a rather sophisticated detection system against the bomber has grown throughout the years. The first component of this detection system is the Distant Early Warning Line or DEW line. The DEW line is the complex of airborne and land based radar installations that stretch from the westward tip of the Aleutian chain through the chain to Alaska, across the northern rim of our continent and on over to Greenland, Iceland and the United Kingdom. Some 6,000 miles in all. This is our northernmost surveillance and detection system. The line of first warning.

In addition to the DEW line there exists some miles to the south—a blanket of surveillance and control radars that covers southern Canada and the United States. This blanket or continuous coverage radar network consists of over 200 interlocking and overlapping radars for the tracking and control functions of our aerospace defense. To give additional warning time to the surveillance and control areas of the east and west coast and off of southern Florida, we have extended this radar coverage out to sea by the use of the United States Air Force radar picket aircraft.

Now, looking at our detection systems and the surveillance and control radars together, this is the complete picture of NORAD's radar coverage against the manned bomber threat. Positive identification of detected penetrations into this entire area has been one of the most difficult problems facing us at NORAD. The difficulty stems mainly from the sheer volume of air traffic that penetrates this surveillance area. Some 200,000 flights pass daily over our North American continent. Some 600 to 1,000 of these flights originate in overseas areas. We must in all cases particularly identify these 600 to 1,000 flights coming in from overseas that could be enemy aircraft. So to assist us in

doing this, we have established Air Defense Identification Zones, abbreviated ADIZ which surround our North American continent. Any aircraft entering these zones are required to file flight plans which gives the estimated time and point or position of penetration of the Air Defense Identification Zone. Then, as the aircraft approaches the zone in flights and penetrates it we immediately check these two things with our radars, the time and the position. If the information does not correlate or compare to the flight plan that the pilot filed, we would immediately declare the aircraft "unknown", scramble our fighter interceptors to go up, intercept and visually identify this unknown aircraft.

Now, as you can see this ground and air radar system is getting a little complex and so far we have only concerned ourselves with the systems designed to detect and identify the manned bomber. In other words, the intercontinental ballistic missile and the space vehicle still must be reckoned with to satisfy our primary requirement, our detection requirement. So in recognition of the capability of these various space objects now and in the future, we have developed other detection systems against them and these are operational today.

The first of these are the NORAD Ballistic Missile Early Warning System which is known as BMEWS. BMEWS consists of three separate identification complexes. One at Clear, Alaska; one at Tule, Greenland; and one over in Yorkshire, England. Each of these sites are equipped with large radars that can scan some 3,000 miles out over the Eurasian land mass—and they are able to detect the missile launches. This BMEWS system could provide us with 15 to 20 minutes warning of intercontinental ballistic missile attack against this continent. Admittedly that is not very much time, but it is enough time to alert our strategic counter offensive forces, the bombers—strategic air command; and our polaris submarine fleet. Of course, we will alert our entire NORAD defense system. The civilian population of Canada and United States will be warned by your civil defense national warning center which is located right near our own Combat Operations Center at NORAD headquarters. But, as is evident, the BMEWS system only warns. And, as of this time, there is no active defense against the intercontinental ballistic missile.

Warning systems against satellites are even more complicated than ballistic missile warning. Our NORAD Space Defense System, SDS, as Lt. Jenks explained it to you—has the satellite warning responsibility. In reality this space defense system is one system composed of many systems. It is made up of electronic and optical detection and tracking devices which we call sensors—located throughout the world. The purpose is to detect, track, and identify all satellite vehicles and —with constant surveillance—predict future satellite behavior and future satellite position. The distances and velocities involved in this satellite warning are so great that radar alone—as we know it—just can't do the job. We use powerful optical equipment, cameras, telescopes and radio trackers which can track a satellite as far as distant planets. It was a radio tracker, for example, that tracked our Mariner 4 satellite on its 134-million mile journey to the planet Mars.

As we have indicated, the space detecting and tracking devices are many and they are operated by many organizations. The United States Air Force Air Defense Command operates the space track portion of the system. This is the Trinidad site. This space track system which uses the long range heavy detection radars of the BMEWS system that we just discussed earlier at Clear, Tule and Yorkshire; as well as its own warning sensor stations at two places—in the Aleutians and in Turkey, which would first detect the launch of any satellite vehicle from the U.S.S.R. Space tracks other radar and optical trackers would then take over and determine the orbital characteristics of the satellite. The Royal Canadian Air Forces—which you have seen a picture of before—is an optical sensor station. This camera has the capacity of photographing an object in space—no larger than a basketball—up to 50,000 miles range. It would take a picture of this satellite so that our experts could fix its exact position in space against the known star background at a given time.

The United States Navy contributes with the space surveillance or spacer system, again all a part of our entire space defense network. This space surveillance system provides additional satellite detection with an electromagnetic fence of high powered radio transmitters and receivers stretched completely across the southern United States. This fence also enables the determination of additional satellite orbital patterns. Of more than 1,500 man made satellites identified since 1957, about 800 have decayed or been deorbited. The rest we have under surveillance today by our Space Defense System. At the present time the United States has successfully launched 314 satellites of which 150 are presently in orbit. Russia has launched 124 space vehicles of which 34 are still in orbit. The United Kingdom has launched 2 satellites successfully; Canada and Italy one satellite apiece successfully; and all but the satellite of Italy are still orbiting in space at this time.

To give you some idea of the tracking and identification problem that our space defense system is faced with, we have the numerous pieces of space debris or space junk that has also gone up into orbit along with the payload. These are such items as extra fuel tanks, rocket or booster motors, little pieces of metal. We must keep track of every piece of material so we will know immediately when anything new is launched up into space. At the present time there is a total of about 707 objects up in space, so you can consider how many pieces of space debris or space junk that we are tracking today. I think you will find it interesting to note that some of these pieces of space debris that we are tracking are actually no larger than a lead pencil.

We have talked about detection and determination of intent. The climax of any air defense effort, of course, is the actual destruction of the enemy, if he is launched against us. Our capability to destroy the enemy varies according to the type of weapons system that he employs. Against the manned bomber, we have an excellent capability. However, the air-to-surface missile carried by the bomber certainly complicates our problem. Since the bomber preferably should be destroyed before it reaches the launch range of the missile that it carries.

In NORAD we have a family of weapons to destroy bombers and these weapons are: our fighter inceptor aircraft, of long-medium range; the "Bomarc", surface to air missile of medium range; and the Nike Hercules and Hawk, short range surface to air missile systems for local or flight defenses. You might refer to it as terminal defense.

Speaking first of our fighter inceptor aircraft, these are the ones we have in use today in NORAD. The first is the F-101 which is called the "Voodoo". This is a supersonic fighter which carries a crew of two, a pilot and a radar operator. The Canadian version of this aircraft—the CF-101, also called the "Voodoo" is the primary Royal Canadian Air Force air defense weapon.

Our next aircraft is the F-102, called the "Delta Dagger". This one is single place, carries just the pilot, also supersonic in speed capability. It has an electronic fire control system that locks onto the target and automatically arms and fires the weapon.

Our next aircraft is one which used to hold the world speed and altitude record. This is the F-104, called the "Starfighter". The F-104 can engage enemy targets above 60,000 feet at speeds up to Mach 2—twice the speed of sound, about 1,400 miles per hour.

Finally the latest of the supersonic century series of jet fighters is the F-106, called the "Delta Dart". This single place, F-106 has a highly sophisticated guidance and fire control system. It can actually take control of this aircraft shortly after take-off, fly through a climb or a cruise to an attack position, fire the armament at optimum range and immediately break this aircraft away to seek other targets. This is all computer fed from a ground installation. We call this system Data-Link.

All of these fighter interceptor aircraft are armed with various combinations of air-to-air missiles. Here is a quick review for you of the missiles that these fighters employ. The first one is the Navy developed "Sidewinder", air-to-air missile. This "Sidewinder" missile employs the passive infrared principle of guidance. That is, it will home-in on the heat emitted by the engines of the target aircraft. The "Sidewinder" is equipped with a conventional high explosive warhead.

NORAD also employs a family of five similar types of guided aerial rockets, all called "Falcons". These "Falcon" missiles employ two types of guidance systems. Some carry the passive infrared guidance, others carry an active radar seeker in the nose of the missile. One of these five types of "Falcons" is equipped with a nuclear warhead.

Finally, we have the "Genie" missile. This is a large unguided air-to-air rocket which carries a nuclear warhead. NORAD aircraft carrying the "Genie" missile is primarily the F-101; its Canadian counterpart is the CF-101, as well as the F-106.

In addition to our fighter interceptor aircraft with their complement of air-to-air missiles, NORAD has a strong surface-to-air missile force. The one with the greatest range is the "Bomarc" surface-to-air missile, used by both the United States Air Force and the Royal Canadian Air Force. The "Bomarc" has a 400 mile range at a speed of Mach 2.8. Almost 2,000 miles an hour and the "Bomarc" is equipped with a nuclear warhead. NORAD also employs the United States Army "Nike Hercules" and "Hawk" surface-to-air missile systems. The "Nike Hercules" will start operating on an enemy bomber as it approaches to within approximately 85 miles of the target area and the "Nike Hercules" may employ either a conventional or a nuclear warhead. This missile reaches a Mach 3-plus velocity—over 3 times the speed of sound—within 30 seconds after launching and has destroyed targets above 100,000 feet. The "Hawk" missile system is more mobile than the "Nike" and has certain characteristics which permit it to intercept very low flying enemy bombers, virtually down to tree top level. The range of the "Hawk" missile—which is a point defense weapon—is approximately 20 miles. The "Hawk" is equipped with a conventional high explosive warhead. We have particularly deployed the "Hawk" down in the Florida regions to guard against the possibility of any low-level sneak air attack from Cuba.

We have indicated to you that our air-to-air missiles and our surface-to-air missiles as well have both conventional and nuclear warheads. While we are still keeping conventional warhead missiles for use against enemy interceptor aircraft in local or brushfire type conflicts—we are turning more and more towards the use of nuclear air defense weapons in NORAD and there certainly is a reason for this. The air-to-air missile or the surface-to-air missile with a nuclear warhead gives us a much greater capability to achieve what we call "weapon kill". That is, the small low-yield air defense weapon will not only destroy the bomber but it will destroy the large multimegaton nuclear weapon that the bomber is carrying. It prevents it from detonating. This obviously prevents any detonation with widespread destruction and greatly lessens the danger to personnel and property on the ground.

This completes our rundown of the fighter interceptors and of the missiles that NORAD employs but there is just a little bit more to the destruction of the enemy than this. In this era of supersonic flights when enemy aircraft are capable of using speeds over Mach 1 in a

dash over their targets, we need to tie our warning systems and our weapon systems to one effective and cohesive defensive fighting force. It is necessary for us to collect, correlate and display all of our vital air defense information at one central point so that tactical decisions may be made quickly and accurately.

To assist us in achieving this necessary speed of decision we use a system called SAGE or Semi-automatic Ground Environment. This system uses high speed electronic data processing computers to automatically collect, correlate and display all of our vital air defense information. The input or the information coming into the computers is from all of our warning systems. From our heavy duty surveillance radars and the DEW line and continuous covered radar network; from our airborne early warning and control aircraft; and from the Federal Aviation Agency in the correlation of commercial flight plans; as well as from the Canadian counterparts of the FAA, the Department of Transport, in Canada.

All of this information is sent directly from the warning stations into the computer. It is collected automatically, correlated almost instantaneously against known and program information and then presented or displayed by the computer to the battle staff for the engagement decision. Certainly, it will make sense to you that we just don't employ computers to make decisions. The man must always make the decision.

Once the battle staff has determined which of our methods will be used against the enemy attack and the sequence of their employment, they can turn right around and inform the computer of their selected decision and the computer can then issue the necessary instructions out to our weapons systems. The computer can solve an intercept problem, predict an intercept point and issue guidance instructions directly to the fighter interceptor aircraft through that system of data-link that we mentioned—and directly to the "Bomarc" surface-to-air missile—as well as providing vital engagement information to the acquisition radars of the "Nike Hercules" and the "Hawk" surface-to-air missile systems.

The computers of the semi-automatic ground environment system (the SAGE system) are housed both at our Region Combat Centers and in our Sector Direction Centers to provide a display of all of the information to the Region and Sector Commanders and their battle staffs. We coordinate our SAGE system in NORAD to operate as our defense in depth against any enemy attack. We want to be able to hit the enemy as far out as possible and continue to increase defensive pressure on him with various weapons as he approaches target areas. We believe that this is vitally important for all of our weapons both now and in the future. At the present time, for example, as an enemy bomber force might approach its target here in the North American continent—first of all the radar controller in a SAGE Direction Center would vector our longest range weapons—our fighter interceptor aircraft—out to electronically computed intercept points at the maximum range of our control facilities so the enemy could be destroyed off of our shoreline or out over unpopulated areas. Then as the elements of the enemy might penetrate the long range defensives, the surviving aircraft would be met by the "Bomarc" surface-to-air missiles and by additional shore to range fighter intercepted aircraft, controlled by our SAGE Direction Center. And finally, any remnants of the enemy raid that might penetrate deep into the defensed area would be destroyed by the "Nike Hercules" and "Hawk" terminal defense missile systems. Again, instructions would pass from the controlling agency, the SAGE Direction Center.

That is the story of the interception and destruction of the man bomber. In the case of the intercontinental ballistic missile, howerer, NORAD is not so fortunate. While we have in our BMEWS system an excellent capability to detect and determine the intention of ICBM's—we can tell where they are going to impact—but we do not presently have the means to destroy it.

Such a system, therefore, is NORAD's prime requirement. The announcement by President Johnson late last year, of our satellite interception and destruction capability, indicates clearly that today we can intercept and destroy a hostile weapon in space. This is an operational capability today and we use two weapon systems with the potential for intercepting and destroying an offensive armed satellite if an enemy chooses to put this type of offensive system into space today. We have effectively tested both of these systems bringing the defensive missile warhead close enough to the satellite to bring it well within the destruction radius. So this is where we stand today in the current aerospace defense operations field.

I will give you a quick wrap up of our operations. In the aerospace defense of North America, NORAD can accomplish the following. We can detect, determine the intention of, and destroy the manned bomber. We can detect, determine the intention of and provide a warning against intercontinental ballistic missile attack over our northern polar regions. And we can detect the launching of satellites. We can predict their orbit, their probable purpose and we can now destroy a hostile weapon in space. But we need a system to destroy ballistic missiles. And we feel we need a greater inspection capability against all satellite vehicles.

Now, on to the future. We can be certainly sure that the enemy will not stand still. We must counter any advance in Russian capabilities—the possible emergence of Red China as a major threat to us—and at the same time move forward with the development of our own technology. ▲

Your Car as a Survival Kit

The following article is reprinted from "NEMO NEWS", *December, 1965, published by the Newfoundland Emergency Measures Organization.*

With auto accidents claiming thousands of lives annually, the idea of using your car as a means of saving your life may seem strange, yet much that you may take for granted may be used in an emergency.

Many drivers, stranded in a blizzard, desert or flood, have stayed alive by simply staying with their car, waiting for help. It is usually easier for search parties to find a vehicle than an individual wandering about, yet the first inclination of a stranded person is often to set out for help. "Too often", says a U.S. Highway patrolman, of the motorist who leaves his car, "he's beyond help when we find him a couple of miles down the road, dead from exhaustion, heat or cold".

When viewed with imagination, it will be seen that an automobile has almost everything required to keep one alive, except food. Drivers can learn to wrest from a car's ton or so of metal, wires and gadgets, the essentials of survival.

For fire fighting, it should be remembered that the car's cooling system contains up to 21 quarts of water, enough to extinguish a fire in the vehicle's upholstery. By using the spigot under the radiator, the water can be collected in a hub cap or other container and quickly brought to bear on the outbreak.

Hub caps can also be used for digging, or one could use the sun visors, the jack handle or even the glove compartment door.

To signal for help there is the car's horn and regular lighting system, or one could unscrew the rearview mirror and use it as a reflective signal. One motorist, with his car broken down at night, removed a sealed-beam headlight leaving it wired to the battery. By using sweeping beams in a wide upward arc, he was able to attract rescuers to his family.

Still another way to signal for help is to burn oil from the car engine in a hub cap or similar container. A little gasoline poured on top of the oil will help to ignite it and the smoke signal thus caused, will rise high into the air and be visible for miles.

In winter, gasoline can be invaluable in starting a fire. It can be obtained via the drain plug at the base of the gas tank or by securing a rag or handkerchief to a wire and thrusting it down the filler pipe. If the need for warmth becomes desperate and there is no other fuel, a tire can be ignited and will burn for three or four hours with the secondary benefit of a dense smoke signal.

Some motorists overlook the obvious fact that their cars have built-in fire starters. When no matches are available the auto's cigarette lighter can be used to ignite gasoline, or, if the motor still runs, a gas-soaked rag could be set ablaze by using sparkers from a spark plug wire.

Extreme care in handling gasoline, which is powerfully explosive even at very low temperatures, should always be exercised.

One of the most obvious uses of a car for survival is as a place to sleep or shelter. In an electrical storm few places are as safe as an automobile with its rubber tire insulation. When a car is used as a shelter from the cold, there may be seat covers or even floor mats that would serve as blankets and keep out some cold or wind.

By using his imagination and remaining calm, a stranded motorist can use his car to withstand the rigors of cold, heat, wind, sleet or snow. The family automobile contains most of the raw materials necessary for family survival. ▲

(The Architect's Role—*Concluded*)

Consideration should be given to some blast and fire resistance based on the idea of the particular building being in a safer area. Retention of buildings, plant and materials is vital to reconstruction planning. Satellite towns will provide a focus for reconstruction. Where possible, interiors of buildings and plant should be kept free of fallout to ease decontamination measures.

The architectural profession must not only be equipped to provide protective construction but must be convinced that such a programme can be effective. While the public and state remain apathetic about any form of constructive vulnerability the architect must carry out his moral duty in leading moves to alter this situation. It is in the interests of the profession to convince clients that they have a community duty to allow for future tragedy. The profession by leading such moves can only raise its esteem in the eyes of the public who must be convinced that shelter provision is not an idealistic dream but a practical possibility. Sweden, a small nation like Australia, has shown an example to be emulated. Conditions of construction and organisation are peculiarly Swedish but the architect can provide similar attitudes in other nations. ▲

NEW TRENDS IN FALLOUT PROTECTION

Reprinted from Civil Engineering—ASCE, *July 1965, with permission Department of Defense, Office of Civil Defense*

SEYMOUR WENGROVITZ, M. ASCE, Chief, Technical Support Branch, Architectural and Engineering Services Division

GORDON W. HIRTLE, Public Information Directorate, Office of Civil Defense, Washington, D.C.

It is clear that existing facilities will not yield enough shelter space to provide fallout protection for all Americans in the event of nuclear attack. This is why the Office of Civil Defense is giving special emphasis to the incorporation of preplanned, dual-purpose shelter areas in the original design of new structures. Engineers and architects throughout the country have a special stake in the fallout-shelter program, for it is the group that is largely responsible for the design and construction of such new facilities.

Authoritative studies by the Department of Defense credit a nationwide system of fallout shelters with a life-saving potential of tens of millions of Americans in the event of a nuclear attack on the United States. The actual number of survivors and casualties, of course, would depend on the type and weight of the attack, weather conditions, and other factors.

These studies employ the most advanced and reliable methods of analysis available to the Federal Government. They demonstrate that in virtually any kind of nuclear attack, a fallout shelter system would save more lives, and at far lower cost per capita, than any other single defense measure the nation could take.

Consequently, the National Fallout Shelter Program is the heart or core of the U.S. Civil Defense effort. Its objective is to provide shelter space for all Americans by: (1) locating, marking and stocking suitable public shelter areas in existing buildings, and (2) having new structures designed and built in such a way as to bring to a maximum the inherent protection they offer their occupants against fallout radiation.

In the past four years, substantial progress has been made on the first task, and a significant start has been made on the second.

Since 1961, when civil defense was made a responsibility of the Defense Department, existing shelter space has been found for more than 134 million persons. As of April 25, 1965, shelters with a total capacity of 73 million have been posted with shelter signs. Enough food and survival supplies have been placed in them to sustain about 32 million individuals for two weeks, or about 52 million persons for 8 days. Of course many more facilities are needed.

The Role of Engineers and Architects

Engineers and architects have had a key role in the shelter program since its inception in the fall of 1961, when the Defense Department decided to survey existing structures in the country and identify those containing suitable shelter areas. It was immediately evident that the Army Corps of Engineers and the Navy Bureau of Yards and Docks—which were to conduct the survey for the Office of Civil Defense—would need the field assistance of a large number of professional personnel trained in this new subject of shelter analysis and design.

For this unprecedented task, the nation's engineers and architects constituted the natural pool or reservoir of "raw talent." To give them the needed special training in shelter analysis and design, the Office of Civil Defense, with the cooperation of educational institutions and professional societies, instituted a unique Professional Development Program. A special two-week course in radiation shielding analysis was developed and then conducted at various schools and universities for architects and engineers to prepare them for their field assignments in connection with the national survey.

Within a few months, about 2,000 engineers and architects had successfully completed the course, and it was they who carried out the massive initial phase of the National Shelter Survey.

The training courses have been continued, and expanded to include design techniques as well as shielding analysis methodologies and knowledge of the effects of nuclear weapons. To date, over 8,000 architects and engineers have successfully completed the course and have been listed in the Department of Defense directory of Fallout Shelter Analysts. As new research data and other technical information become available, it is disseminated to these analysts to keep them abreast of the latest developments.

In addition to the Fallout Shelter Analysis courses, other tuition-free courses in protective construction and environmental engineering are offered on a continuing basis in various cities throughout the United States. In the 1965 spring semester, approximately 135 courses were under way.

The initial emphasis was placed on analyzing and evaluating the fallout protection characteristics of existing structures—a type of post-design analysis. Since 1962, however, both the courses and the entire Professional Development Program have been enlarged in scope. They now include the increasingly important area of protective design and construction; and they

provide the orientation and training that engineers and architects must have in order to include fallout protection in the original design and building of new structures. Increasing attention is now being given to this aspect of the national shelter program, both by OCD and by the architectural and engineering community.

Hypothetical Designs—The First Step

To demonstrate the feasibility of designing low-cost, dual-purpose shelter space in new buildings and to develop new ideas on how this could be done, the Office of Civil Defense sponsored a National School Fallout Shelter Design Competition in 1962, with the cooperation of the American Institute of Architects. Since more than one quarter of the U.S. population attends school, this was considered an appropriate subject for the competition. Over 100 elementary-school designs were obtained, incorporating dual-purpose shelter space for students, faculty and residents of the surrounding neighborhood.

This was followed by a similar competition on the design of fallout shelter space in shopping centers, and also by a five-day design conference at Rice University on fallout-protected industrial plants.

The designs submitted in these projects illustrated how dual-purpose fallout shelter space could be incorporated in new buildings without adversely affecting their cost, appearance or day-to-day function. The buildings were attractive and functional and the areas designated for emergency use as fallout shelters were completely usable for normal purposes.

These design projects served a useful purpose by demonstrating the theoretical feasibility of the shelter concept. But the designs submitted were still hypothetical. They were not proved to be practical until individual buildings containing preplanned shelter space had actually been designed and constructed. This is now happening.

New Trends in Building Construction

More and more architects and engineers are now becoming conscious of the need for fallout protection and many of them are designing new buildings in such a way as to enhance the inherent protection provided, without impairing either function or appearance.

In essence, all buildings are shelters of one kind or another. They are built to protect people and their possessions from the elements and from hostile forces, and to provide privacy. As building design and construction have evolved and improved, new protections and conveniences have been incorporated. For example, central heating systems and air-conditioning have been added to provide better shelter for building occupants against the extremes of cold and heat; walls, roofs and windows have been insulated for the same reason; acoustical walls and ceilings have been added to provide more protection against noise; electric lighting has been introduced as protection against hazards of darkness; portable fire-extinguishers, firewalls and fire doors are appurtenances commonly accepted in current building design.

Two things combined to bring about these improvements in buildings. First the need was recognized and defined; and second, new knowledge made it possible to solve the problem and meet the need.

This is exactly what has happened in the field of fallout protection. A great deal of new scientific and technical knowledge has been gained in the past decade concerning the nature and effects of radioactive fallout from nuclear explosions. This new knowledge has enabled men to define and measure its hazards. It has also enabled them to design and construct structures that will offer protection against fallout radiation—not necessarily special-purpose structures such as underground windowless bunkers, but conventional buildings that will serve their usual daily functions and still protect occupants against fallout radiation should the need ever arise.

Every building to some extent provides a natural shield against fallout radiation. Some buildings, however, are better than others. In the National Fallout Shelter Survey, millions of suitable shelter spaces were found in existing buildings, even though no consideration had been given to fallout protection when they were first designed and built. Many other buildings would have provided reasonable protection, but they had weak points which nullified otherwise good protection. If such weak points in structures now being built are detected by someone knowledgeable in radiation shielding during the initial design phase, then design changes can be made that will provide maximum fallout protection with little or no increase in cost. The incorporation of fallout protection in this manner is called "slanting."

Slanting Techniques

Many architects and engineers are now using slanting techniques in designing new structures. These are the major factors involved in slanting:

1. Location and quantity of window areas. Can window areas be reduced or sills raised to reduce exposure to radiation?

2. Site conditions. Is the structure so located that maximum advantage is taken of mutual shielding from adjacent structures? Has consideration been given to the use of retaining walls, roof overhangs, or grading a slope away from the structure to minimize the effect of radiation from the ground? The inclusion of masonry screen walls or brick planter boxes will enhance the esthetic value of the structure and also increase the

barrier shielding. It is also possible to improve the fallout protection by judicious site work and utilization of earth berms. See Fig. 1.

3. Basement. Is it possible to depress the ground floor partially or completely below grade to reduce the effect of radiation from the ground? See Fig. 2.

4. Entrances and exits. Have these been located to maximize the protection by baffles, or do they permit direct entry of ground radiation? Can stairwells be positioned so that they provide additional shielding at the ends of corridors and hallways? See Fig. 3.

5. Interior partitions. Have these been placed to block radiation?

6. **Walls.** Have dense, solid walls been used advantageously? Have hollow walls been filled with low-cost materials, where feasible? Has consideration been given to using reinforced concrete or concrete block construction in lieu of lightweight aggregate block or other lightweight wall construction? Have low-cost opportunities been exploited, such as the use of hollow tile or concrete block filled with sand or gravel to provide additional mass in interior and exterior walls? See Fig. 4.

7. Floors and roofs. Has a comparison been made of various systems, such as concrete slabs on precast T-beams or bar joists; composite floor systems, such as tile or terrazzo on concrete, or two-way slab design versus pan-joist construction? Cost differences may be negligible, but one system may provide significant additional shielding. The addition of a few inches of concrete topping to a precast concrete T-roof or floor slab system will do much to enhance the protection afforded occupants. See Fig. 5.

8. Architectural arrangements. Has maximum advantage been taken in arranging the building modules to provide a protected core area that can be used for shelter?

If the protective requirements are clearly understood, the architect-engineer will find many ways in which the

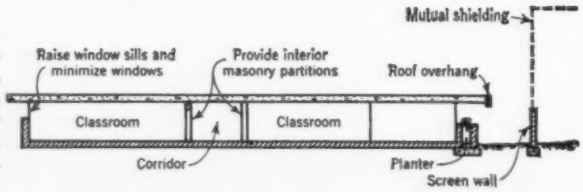


FIG. 1. Low-cost "slanting" techniques for barrier shielding include such features as screen walls, planter boxes, roof overhang, and raised windows.

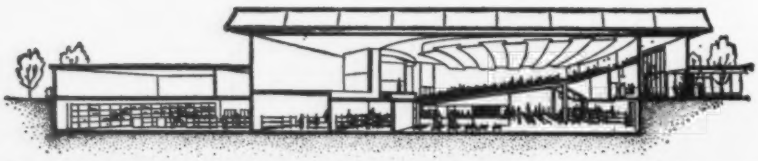


FIG. 2. Cafeteria area placed beneath sloping auditorium floor provides additional fallout protection for a school at an increase of less than 0.2 percent in bulding cost.

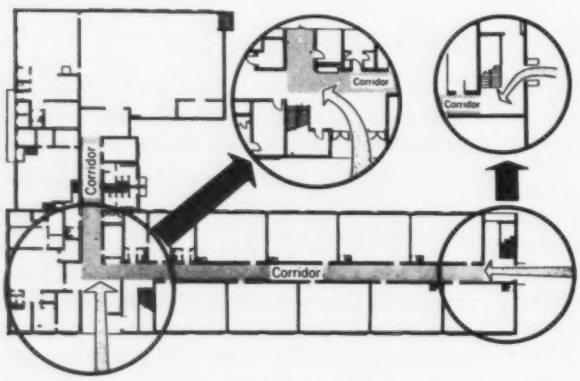


FIG. 3. First-floor plan of a typical elementary school shows that corridor areas offer best shelter potential. Their protective value is enhanced by relocation of stairwells and partial baffling of entranceways, shown by arrows.

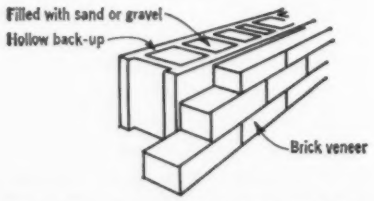


FIG. 4. Use of low-cost material to fill hollow tile provides additional mass in interior and exterior walls.

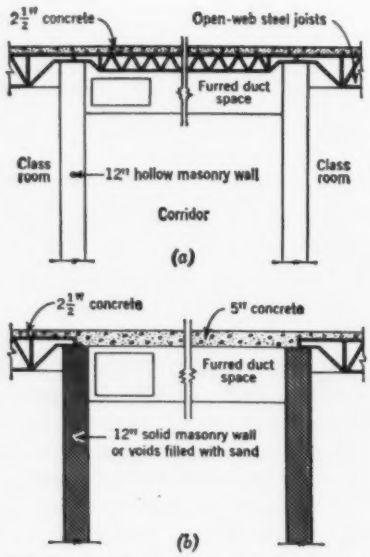


FIG. 5. Normal construction can be revised to give added fallout protection. Minor structural changes brought mass of roof, which was 31 lb per sq ft, in *(a)*, up to 62 lb per sq ft in *(b)*.

protective characteristics of the building can be enhanced with little or no increase in cost and without sacrificing esthetics or functional efficiency. While maximum protection may not always be achieved, a higher level of protection can usually be attained.

Examples of Actual Structures

Recently the Office of Civil Defense published a booklet entitled "New Buildings with Fallout Protection." This publication shows for the first time some of the actual accomplishments of architects and engineers in incorporating preplanned, dual-purpose shelter in the original design of actual buildings recently constructed or now under construction. It illustrates how architects and engineers, by using simple and inexpensive design techniques, have increased or maximized the inherent fallout protection offered by these structures.

The 34 buildings pictured and described in the booklet are not hypothetical designs—they are actual buildings. While over half of the projects are schools, others include police and fire stations, apartments, office buildings and churches, all of them designed with fallout protection in mind. Actual cost data furnished by the designers involved confirm that dual-use fallout-shelter space need not be expensive if it is planned for early enough in the design stage. In many cases, the shelter protection was inherent in the building design and was achieved at no increase in cost.

In this booklet, "New Buildings with Fallout Protection," the new theory—that fallout shelter can be incorporated in new buildings without adversely affecting their cost, appearance or function—is shown to be feasible, practical, and desirable.

Summary

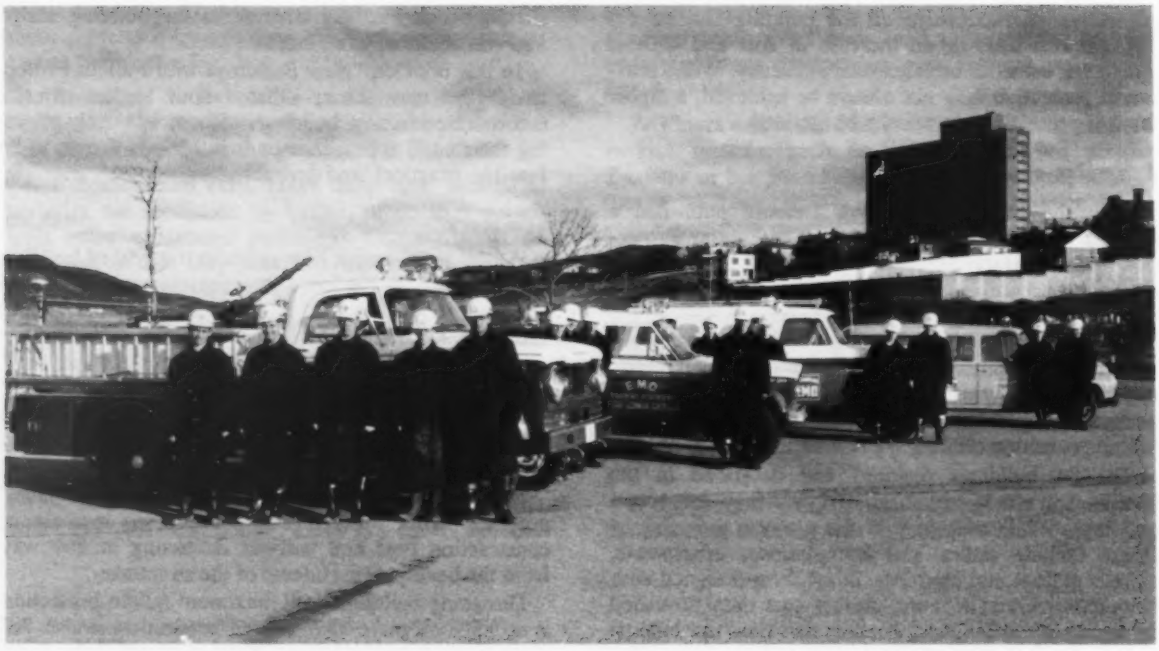
A new requirement now exists in the field of building design and construction—the requirement that a new building should protect its occupants against fallout radiation, in addition to its other functions.

A large number of this nation's architects and engineers are now knowledgeable in radiation shielding analysis and design, and are becoming skilled in the use of the new "slanting" techniques to maximize fallout protection in their current design projects.

New buildings can be designed and built with dual-purpose fallout protection at little or no increase in construction cost and without detracting in any way from the beauty or usefulness of the structures.

Designing buildings with maximum fallout protection is no longer a mere theory or an academic exercise. All over America today, more and more such buildings are being constructed. ▲

Some of the members of the Pointe-Claire, Quebec, Fire and Rescue Unit and the trophies they won for Heavy Rescue and First Aid in International competitions since 1960.



Elements of the Auxiliary Fire Brigade, City of St. John's, Newfoundland. The combined efforts of Newfoundland Emergency Measures Organization, the Fire Commissioner's Office and the Financial Assistance Programme of Canada EMO are producing an effective emergency fire service for Newfoundland. Here auxiliary fire personnel display FAP equipment.

EMO NATIONAL DIGEST

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